Therapeutic effect of bee venom in sows with hypogalactia syndrome postpartum

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The objective of this study was to determine the clinico-therapeutic effect of whole bee venom in hypogalactic sows postpartum. Sows after parturition were assigned to treated and nontreated control groups. In the treated group, 22 sows were bee acupunctured once a day for 3 consecutive days. Honeybees (Apis mellifera L.) for bee acupuncture were about 15 days after metamorphosis. One live bee was used to sting the acupoints known as Yang-ming (ST-18, 1.5 cm lateral to the base of the last 2 pairs of teats) and Jiao-chao (GV-1, at the indentation between the base of tail and the anus). In the control group, 20 sows were intramuscularly injected with a standard dosage of penicillin G (400,000 IU/head) once a day for 3 consecutive days. At post-treatment, 85.0% of the drug-treated control and 90.9% of the bee venom-treated group recovered from hypogalactia syndrome. The advantages of apitherapy were that the patients did not have stress because they were not restrained for a long period. The result suggested that apitherapy using bee venom is an effective treatment for sows with hypogalactia syndrome postpartum.

Key words: Apitherapy, bee venom, hypogalactia, sow

Introduction

Since ancient times people have speculated about honey’s curative properties. The ancient Greeks, Romans, Chinese and Egyptians used honey to heal wounds and to cure gut disease [25].

Apitherapy involves the medicinal use of honeybee products, and it is as old as beekeeping itself. Hippocrates wrote about it, and there is mention of it in Chinese texts that are 2,000 years old [2]. Apitherapy began as a part of folk medicine, and even today, most of the people using it is therapy either do it themselves or do so with the help of lay practitioners who administer the live bee sting. Furthermore, honeybee venom has been domesticated and a number of its antimicrobial peptides have been isolated, making it the one used most often for treatment.

Acupuncture, moxa, point bleeding and massage proved to be effective within a few days in cases of acute mastitis, breast abscess, and breast carbuncle in women [7,12,24]. Acupuncture cured mammary fibrocystic disease in women within 3 weeks and can be used in the differential diagnosis of fibrocystic disease from mammary carcinoma [3]. Acupuncture was also effective in mammary hyperplasia [9], and primary agalactia and hypogalactia [5].

This study was undertaken to determine the therapeutic effect of bee venom by administering of whole bee venom to acupuncture points in sows with hypogalactia syndrome postpartum.

Materials and Methods

A total of 42 cases of sows with hypogalactia syndrome postpartum were treated over the period of seven months in 1998. Sows with hypogalactia syndrome postpartum were selected for the study from local rearing farms. Clinical symptoms were recorded and animals were allocated to one of two treatment groups.

Sows with hypogalactia syndrome postpartum were randomly assigned to control and treatment groups. Both acupoints of Yang-ming (ST-18, 1.5 cm lateral to the base of the last 2 pairs of teats) and Jiao-chao (GV-1, at the indentation between the base of tail and the anus) were chosen for the bee sting (Fig. 1). In the treated group, 22 sows were bee-acupunctured on both acupoints once a day for 3 consecutive days. In the control group, 20 sows were intramuscularly injected with a standard dosage of penicillin G (Green-Cross Vet Pharm Co., 400,000 IU/head) once a day for 3 consecutive days.

Whole honeybees used for apitherapy in this study were raised at the farm of the Agricultural College of Chungbuk National University. Bees of about 15 days old after
metamorphosis were used, since they are known to have about 0.1 mg of bee venom in their poison sacs, a strong bee sting, and are easy to acupuncture.

Clinical findings of rectal temperature, milky discharge and udder hardening were observed during and after the treatments. Bacteria of the mammary gland in healthy and hypogalactic sows were detected using an auto microorganism analyzer (bioMerieux Vitek, WSVTK-RO5.04, USA).

All results are expressed as mean ± SD, and were analyzed using one-way analysis of variance (ANOVA). The significance of differences was tested using the paired Student’s t-test. The criterion for significance was p<0.05.

Results

The criteria for hypogalactia syndrome postpartum in sows are swelling and hardening of one or several udder glands with insufficient milk production. Rectal temperature and udder changes were also observed during the experimental period. Veterinarians performed a careful examination of affected animals with a rectal temperature exceeding 39.3°C within 48 hours of farrowing. The rectal temperature of the affected sows was slightly higher than that of healthy sows postpartum (Fig. 2). The period of milky discharge was significantly shorter for bee venom treated animals than for those receiving drug treatment (Fig. 3, p<0.05).

Among the several bacteria identified, *Escherichia coli*, *Streptococcus* spp. and *Staphylococcus* spp. were predominantly isolated (Table 1). The bacteria were isolated as pure and as mixed cultures from the mammary glands.

Post-treatment, 85.0% of the drug-treated control sows and 90.9% of bee venom-treated sows recovered from hypogalactia syndrome postpartum (Table 2). Moreover, the bee acupunctured sows did not show any side effects, such as infection, bleeding or intoxication.

Discussion

Hypogalactic syndrome postpartum occurs more or less in all sow herds. Sows with hypogalactic syndrome are a source of economic loss to the swine industry. Affected sows show swelling and hardening of one or several udder glands, and insufficient milk production. In healthy sows, milk ejection usually starts within <30 seconds after the initiation of nursing behavior and is of short duration (<30 seconds). The primary clinical signs of periparturient hypogalactia syndrome (PHS) concern the sow’s inability to produce sufficient milk [10,13] to meet the nutritional requirements of the piglets. The PHS is observed almost exclusively within the first 3 days postpartum, with more than 50% of the affected sows showing clinical signs of insufficient milk production within 24 hours postpartum [10]. PHS is only rarely observed more than 72 hours postpartum [10,16].
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Table 1. List of bacteria isolated from the mammary glands of healthy and hypogalactic sows postpartum

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>Healthy sows (%)</th>
<th>Hypogalactic sows (%)</th>
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</thead>
<tbody>
<tr>
<td><em>Escherichia coli</em></td>
<td>11(28.9)</td>
<td>12(28.6)</td>
</tr>
<tr>
<td><em>Streptococcus spp.</em></td>
<td>7(18.4)</td>
<td>11(26.2)</td>
</tr>
<tr>
<td><em>Staphylococcus spp.</em></td>
<td>9(23.7)</td>
<td>8(19.0)</td>
</tr>
<tr>
<td><em>Corynebacterium spp.</em></td>
<td>5(13.2)</td>
<td>4(9.5)</td>
</tr>
<tr>
<td><em>Proteus</em></td>
<td>3(7.9)</td>
<td>2(4.8)</td>
</tr>
<tr>
<td>Others</td>
<td>3(7.9)</td>
<td>5(11.9)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>38(100)</strong></td>
<td><strong>42(100)</strong></td>
</tr>
</tbody>
</table>

Table 2. Therapeutic effects of penicillin and bee venom in sows with hypogalactia syndrome

<table>
<thead>
<tr>
<th>Groups</th>
<th>Incidence (head)</th>
<th>Recovery (head)</th>
<th>Cure rates (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin-treated</td>
<td>20</td>
<td>17</td>
<td>85.0</td>
</tr>
<tr>
<td>Bee venom-treated</td>
<td>22</td>
<td>20</td>
<td>90.9</td>
</tr>
</tbody>
</table>

There is good evidence that milk production in sows is decreased by several causes [21]. This multiplicity of etiologies is reflected in the names that have been associated with this disease complex: coliform mastitis, PHS, agalactia toxemia, puerperal mastitis, dysgalactia, mastitis-metritis-agalactia (MMA) syndrome, and puerperal toxemia [1,16,19,21,23]. While most sows show decreased milk production, only infrequently is there true agalactia. Likewise, metritis is rarely part of the syndrome. PHS more accurately describes the problem [21].

Our results and those of Hermanson et al [10] show an increase in rectal temperature of 1.0-1.5°C in affected animals. However, the rectal temperature of clinically normal sows is increased during the first 1-2 days following parturition. When examined at 1 day prior to parturition, rectal temperature was found to be both unchanged [6] and increased [8,18].

The mammary glands of PHS animals may vary in appearance from normal or firm and locally warm to the touch to grossly swollen with a blotched appearance [11]. Milk samples collected from affected sows were serous or creamy and contained fibrin and blood. These clinical signs are very similar to those reported by Penny [16], Bertschinger and Pohlenz [1], and Ross et al [20].

De Passille and Rushen [4] demonstrated that in some cases the clinical presentation may be different, with only the piglets affected. In this case, the sow is clinically normal, yet the piglets do not grow at the expected rate due to excessive teat fighting or neonatal diarrheas. The majority of sows with hypogalactia were anorectic, constipated, or depressed as mentioned by Hermanson et al. [10] and Bertschinger and Pohlenz [1].

Lactation insufficiency in the sow is an extremely complex syndrome, and over 30 different etiologies have been associated the problem. Gram-positive bacteria were identified in a high percentage of affected sows and were the most important cause of sows with agalactia [17,20]. Oren and Shai [15] were reported that an affected sow, attributed to bacteria of the genera *Escherichia coli*, *Staphylococcus spp.* and *Streptococcus spp.* treated with bee venom melittin, showed complete lysis of both Gram-positive and Gram-negative bacteria, as revealed by transmission electron microscopy.

Honeybee venom contains at least 18 active substances. Mellitin, the most prevalent, is one of the most potent anti-inflammatory agents known (100 times more potent than hydrocortisol). Adolapin is another strong anti-inflammatory substance, and inhibits cyclooxygenase. Apamin inhibits complement C3 activity, and blocks calcium-dependent potassium channels, thus enhancing nerve transmission. Other substances, such as Compound X, hyaluronidase, phospholipase A2, histamine, and mast cell degeneration protein, are also involved in the inflammatory response of the venom, in during a softening of tissue and the facilitation of fluid flow. The mode of action of the bee venom, melittin, is considered to be via pore formation in the bacterial membrane, thus influencing the permeability of translocation, but details have not yet been clarified [14].

In summary, the advantages of apitherapy were, that patients did not have to be restrained for a long period, and that client acceptance was high, as the owners were accustomed to seeing their animals receive routine injections. Bee venom has antibacterial activity and is effective in controlling of hypogalactia in sows.

Acknowledgment

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References